REMARKS

The only independent claims remaining for the Examiner's consideration are claims 24, 28, 32 and 44. For purposes of this Preliminary Amendment only, the applicant relies on the same features in all of those claims to support patentability.

Claims 7, 12, 13 and 22 from the applicant's U.S. Patent 5,661,645 ("the original '645 patent") have been amended to correct minor formal errors. Independent reissue claims 24, 28, 32, and 44 have been amended, and new dependent claims 46-53 have been added. Independent claims 25-27, 29-31, 33-35 and 45, and dependent claim 40, have been canceled. Only allowed original patent claims 7-23, and added reissue claims 24, 28, 32, 37, 38, 41, 42, 44, and 46-53 are in the application.

A Submission of Corrected Drawing is also enclosed to make a minor change to Figure 6a. This change is discussed in more detail below.

A supplemental reissue declaration to cover the claim amendments made herein is enclosed.

This Preliminary Amendment is submitted with a Declaration of Peter A. Hochstein, dated April 12, 2007 ("the Hochstein Declaration"), which will be referred to from time to time in the following discussion.

The claims shown above appear as they will in the reissue patent issuing from the present application (that is, with added text underlined and deleted text in brackets), assuming that the present Preliminary Amendment is deemed to place the application in condition for allowance. The status of all of the claims in the application is shown in the attached Appendix. The claim

changes made by the present Preliminary Amendment are shown in the Appendix by underlining text added to the claims and striking through text deleted from the claims.

Independent claims 24, 28, 32, and 44 presented herein use wording different from that in the Amendment Under 37 C.F.R. § 41.33(a) of October 13, 2006. Since that Amendment was not entered (see Advisory Action After the Filing of an Appeal Brief, January 1, 2007), the claim changes in the Appendix are shown relative to the claims as they existed prior to the Amendment Under 37 C.F.R. § 41.33(a).

The Advisory Action requested that the applicant indicate where the present application discloses a conflict monitor compatibility circuit as recited in the claims. Taking independent claim 24 first, the following table from paragraph 4 of the Hochstein Declaration indicates where the specification and drawings describe an embodiment of a power supply assembly having all of the features recited in claim 24 (references are to the applicant's original '645 patent):

Claim 24	Disclosed Embodiment
A power supply assembly for powering light emitting diodes (LEDs) in an outdoor line-connected signal, comprising:	A power supply assembly 10 connected to an a.c. line voltage powers a light emitting diode array signal 12. Col. 5, lines 11-13; Fig. 5.
an electrical input for coupling to a source of a.c. line voltage through a solid state traffic controller switch for providing an electrical input voltage having an operating range when the switch is on;	The assembly 10 includes an electrical input 22 coupled to the a.c. power line through a solid state switch that provides operating voltages from 85 to 140 volts (a nominal 120 volt a.c. line). Col. 5, lines 15-18, col. 6, lines 27-30; Figs. 5, 6a, 6b.
a rectifier coupled to the electrical input and having a rectifier output;	A full wave rectifier 32 is coupled by lines 30 to the electrical input 22 and has an output 34. Col. 5, lines 35-39; Fig. 5.
a line voltage regulating switchmode power supply having a power supply input coupled to the rectifier output and a power supply output;	A line voltage regulating switchmode power supply 38 has an input coupled to the rectifier output 34 and an output 42,44. Col. 5, lines 41-54; Fig. 5.

a plurality of LEDs coupled to the power supply output and having multiple current paths for emitting light in response to the power supply output; and	A plurality of LEDs 16 coupled to the power supply output 42,44 have multiple current paths and emit light in response to the power supply output. Col. 5, lines 5-10, col. 6, lines 24-27; Fig. 5.
a conflict monitor compatibility circuit including a low impedance load and a transistor in series connection with the low impedance load,	A circuit 24 includes a low impedance resistor 60 connected in series with a transistor Q2. The circuit 24 "eliminates problems with conflict monitors." Col. 6, lines 57-62, col. 7, lines 12-15, 46-50; Figs. 5, 6a, 6b.
the transistor being biased as a switch having an essentially nonconductive condition whenever the electrical input voltage is within the operating range and	The bipolar transistor switch Q2 is off ("essentially nonconductive") whenever the traffic controller switch is on to provide the nominal 120 volts (with a range of 85-140 volts) at the electrical input 22 so that a Zener diode D5 reverse-conducts from cathode to anode. Col. 7, lines 45, 63-67; Fig. 6b.
an essentially conductive condition if the electrical input voltage drops below a predetermined value lower than the operating range,	The transistor Q2 is on ("essentially conductive") if the electrical input 22 drops below 40 volts (lower than the 85-140 volt operating range) and prevents the Zener diode D5 from conducting in the reverse direction. Col. 7, lines 53-60; Fig. 6b.
wherein the transistor in the essentially conductive condition couples the low impedance load to the electrical input for shunting leakage current from the solid state traffic controller switch when the switch is off.	"If the Zener diode D5 does not conduct, the transistor Q2 is turned on to place the load resistor 60 [in] the power lines 22 causing the leakage voltage [from the solid state switch] to drop below 10 volts." Col. 7, lines 18-30, 59-62; Fig. 6b.

Claims 28 and 32 are similar to claim 24, except that the "line voltage regulating switchmode power supply" of claim 24 is replaced in claim 28 by "a switchmode power supply for maintaining current and voltage waveforms substantially in phase and for providing a regulated current output with respect to variations in the input line voltage," and is replaced in claim 32 by "a switchmode power supply for improving poor power factor, whereby the power supply provides essentially constant current at a power supply output with respect to variations in line voltage input, and whereby current and voltage waveforms are maintained substantially in

phase." Embodiments of these power supplies, which are conventional, are generally described at column 5, lines 42-57, of the original '645 patent. Hochstein Declaration, para. 5.

It will be readily apparent from the above discussion of claim 24 that the present application contains a description of an embodiment of the circuit recited in claim 44. Hochstein Declaration, para. 6.

The above claim chart for claim 24 discusses the Zener diode D5, which in claims 47 and 48 provides an embodiment of the recited sensor that switches the transistor Q2 on and off at the same predetermined voltage. The recited control element in the disclosed embodiment is the npn bipolar transistor Q1 that switches the first transistor Q2 on and off when the transistor Q1 is off and on, respectively. Col. 5, lines 4-10, 57-67, Figs. 6a, 6b, of the original '645 patent. Dependent claims 51-53 are similar to claims 46-48, respectively, but depend from claim 44. Accordingly, claims 51-53 also recite structure that is described in the context of a preferred embodiment in the disclosure of the present application. Hochstein Declaration, paras. 7, 8.

Of course, pointing out where the specification describes preferred embodiments of claim features does not limit the claims to those embodiments. Accordingly, the above discussion should not be taken as an indication that the claims are so limited. In addition, the phrase "coupled to" used in the claims does not require a direct connection between the "coupled" circuit elements. Rather, it refers to the operative interconnection between the elements that enables the claimed structure to operate as claimed. Hochstein Declaration, para. 9.

This discussion focuses on U.S. Patent 5,075,601 to Hildebrand ("Hildebrand") and the differences between it and the conflict monitor compatibility circuits in independent claims 24, 28, 32, and 44. That should not be taken as an indication one way or the other as to the relevance

to those claims of the other references used from time to time to reject the applicant's claims. In addition, the conflict monitor compatibility circuit recited in claim 24 is representative of the similarly recited structure in independent claims 28, 32, and 44. That is, any differences among claims 24, 28, 32, and 44 are not specifically relevant to the differences between the claimed invention and Hildebrand. Hochstein Declaration, para. 11.

The claimed conflict monitor compatibility circuit is an important feature of power supply assemblies with signals that are lit by LEDs controlled by a solid-state traffic controller switch (as recited in claims 24, 28, 32, and 44) rather than by the long-conventional incandescent lamps. Prior art signals include a conflict monitor circuit as a safety feature. This circuit senses if signals being displayed conflict with each other, such as by showing green lights at intersecting streets. This can happen if, say, a lightning strike creates a power surge that damages the solid state traffic controller switch and causes it to display conflicting green lights. A conflict monitor circuit detects the conflict and initiates remedial action to prevent accidents, such as changing all of the signals to a flashing-red mode. However, using existing conflict monitor circuits designed for incandescent lamp signals with more modern LED signals can cause false conflict detection. The claimed conflict monitor compatibility circuit solves this problem, and also maintains the low power consumption that is one reason for lighting traffic signals with LEDs in the first place. Hochstein Declaration, para. 12.

One source of the false-conflict problem is a difference between the electrical characteristics of LEDs and incandescent lamps. An incandescent lamp that is switched on has a relatively high resistance while generating light. When power to the lamp is off, it exhibits a much lower resistance (impedance). Conflict monitor circuits sense that a lamp is off when a

relatively low voltage is present due to the low lamp resistance. When operating properly, the conflict monitor circuit detects if the voltages associated with crossing streets' green lights exceed a predetermined value, indicating that the green lights for both streets are on at the same time. If so, the conflict monitor circuit assumes a traffic controller switch malfunction and changes the intersection to an all-flashing-red mode. Hochstein Declaration, para. 13.

LED signals are different because, unlike incandescent lamps, they typically exhibit a relatively high input impedance in the presence of even low currents, such as normal leakage currents from a solid state traffic controller switch that is turned off. These leakage currents do not cause a problem with incandescent lamps because incandescent lamps have a relatively low impedance at these low leakage currents. But with an LED traffic signal, the voltage can be appreciable even when the traffic control switch is turned off. So when LEDs are combined with conflict monitor circuits that use elevated voltage to indicate the existence of a conflict (two "on" green lights at crossing streets), false conflict determinations can occur even if the traffic controller switch is functioning properly. This is because leakage currents, which are present during normal operation of the solid state traffic controller, are not shunted from the conflict monitor circuit by LED signals as they would be by incandescent lamps. In other words, a green-light LED signal subjected to leakage currents can create a high-voltage "false positive," which the conflict monitor circuit interprets as a lighted LED, even if it is not in fact lit. See original '645 patent, col. 5, lines 15-30; Hildebrand, col. 1, lines 11-33. Hochstein Declaration, para. 14.

There were solutions to this problem before the claimed conflict monitor compatibility circuit, but none of them enabled full advantage to be taken of the low power consumption of LEDs as compared to other types of illuminating devices such as incandescent lamps or

luminescent (neon or fluorescent) lights. One solution was placing a large capacitor across the inputs to the LEDs to absorb the leakage currents. This defeated the purpose of using LEDs for their low power consumption because of the reactive power drawn by the capacitor. See original '645 patent, col. 5, lines 23-30. Another solution is shown in Hildebrand, which was used to reject the claims, but as discussed below, Hildebrand's "dynamic load circuit," like a capacitor, also mitigates the advantages of using LEDs in the first place. Hochstein Declaration, para. 15.

The following language in particular distinguishes the claimed invention from prior art traffic signal circuitry such as that shown in Hildebrand:

> a conflict monitor compatibility circuit including a low impedance load and a transistor in series connection with the low impedance load, the transistor being biased as a switch having an essentially nonconductive condition whenever the electrical input voltage is within the operating range and an essentially conductive condition if the electrical input voltage drops below a predetermined value lower than the operating range, wherein the transistor in the essentially conductive condition couples the low impedance load to the electrical input for shunting leakage current from the solid state traffic controller switch when the switch is off.

Hochstein Declaration, para. 16.

The claimed conflict monitor compatibility circuit includes a transistor biased as a switch, so that a low impedance load is either out of the circuit (the transistor is in the essentially nonconductive condition), whenever the electrical input voltage is within its operating range, or is coupled to the electrical input (the transistor is in the essentially conductive condition), if the electrical input voltage drops below a predetermined value lower than the operating range. The essentially nonconductive condition thus exists any time the solid state traffic controller switch is on, meaning that the electrical input voltage is in its operating range (between, say, 85 and 140 volts; see original '645 patent, col. 6, lines 27-30, col. 7, lines 63-67). However, if the electrical input voltage drops below a predetermined value (say, 40 volts; see original '645 patent, col. 7,

lines 41-46), which indicates that the solid state traffic controller switch is off and the sensed voltage is due to leakage currents, the transistor is in its essentially conductive condition. This couples the low impedance load to the electrical input to reduce the leakage voltage to a value that is consistent with the proper operation of the conflict monitor circuit (say 10 volts; see original '645 patent, col. 7, lines 47-48). Shunting the leakage current through the low impedance load in this manner enables proper operation of the conflict monitor circuit because the artificially elevated leakage voltage cannot trigger a false conflict. In other words, the conflict monitor circuit will detect a low voltage (indicative of a low impedance), just as it would if the traffic signal used incandescent lamps, thus making prior art conflict monitor circuits compatible with LED-lit signals by preventing high-voltage, "false positive" conflict indications. Hochstein Declaration, para. 17.

During the pendency of the present application, the Examiner has contended that Hildebrand's dynamic load circuit shown in Fig. 1A corresponds to the present conflict monitor compatibility circuit. The Examiner has equated Hildebrand's MOSFET transistor Q3 and resistor R7 to the transistor and low impedance load, respectively, of the conflict monitor compatibility circuit as claimed in prior versions of claims 24, 28, 32, and 44. Hochstein Declaration, para. 18.

The applicant disagrees that Hildebrand discloses the applicant's claimed conflict monitor compatibility circuit. Further, the applicant disagrees that one of ordinary skill in the art would have found it obvious to modify Hildebrand to provide such a circuit, and believes that there would have been little motivation to do so, based on the testimony and exhibits presented in paragraphs 19-27 the Hochstein Declaration, which are incorporated herein by reference.

SUBMISSION OF AMENDED DRAWING

The enclosed separate Submission of Amended Drawing makes a minor change to Fig. 6a, as explained in detail in the Submission of Amended Drawing. *See* 37 C.F.R. § 1.173(b)(3). Pursuant to 37 C.F.R. § 1.173(b)(3)(i), the following explains the change to Fig. 6a.

There should be illustrated in that figure a functional connection between the "voltage sensing means" 48 and the "controlled load means" 50, as represented in Fig. 6b by the circuit line including the resistor 58. See col. 7, lines 57-59. Accordingly, there should be a line between these two "means" in Fig. 6a to make the drawings consistent with the description in the specification. Hochstein Declaration, para. 10.

The Submission of Amended Drawing adds that line to Fig. 6a. It also adds the word "Amended" to Fig. 6a, in accordance with 37 C.F.R. § 1.173(b)(3).

SUPPLEMENTAL REISSUE DECLARATION

A Supplemental Declaration for Reissue Patent Application To Correct "Errors" Statement (37 CFR 1.175 (Form PTO/SB/51S), executed by the inventor is enclosed.

INFORMATION DISCLOSURE STATEMENT

The enclosed Form PTO/SB/08B is a copy of the form submitted with the Amendment Under 37 C.F.R. § 41.33 of October 13, 2006. The listed documents are Exhibits A and C from the Hochstein Declaration. Copies of those documents are included with the declaration.

The Examiner is requested to return a copy of the Form PTO/SB/08B indicating that he has considered the listed documents.

SUMMARY

For all of the reasons put forward above, the applicant believes that remaining original patent claims 7-23 and added reissue claims 24, 28, 32, 37, 38, 41, 42, 44, and 46-53 are patentable, and requests that they be allowed.

The total number of claims (and the number of independent claims) in the present application has been reduced. Accordingly, it is believed that no extra claims fee is required on account of this Preliminary Amendment. However, if there are any fees due in connection with this paper, they may be charged to Deposit Account No. 14-1131.

All correspondence and telephone inquiries should be directed to the applicant's undersigned attorney.

Respectfully submitted,

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FIG - 4

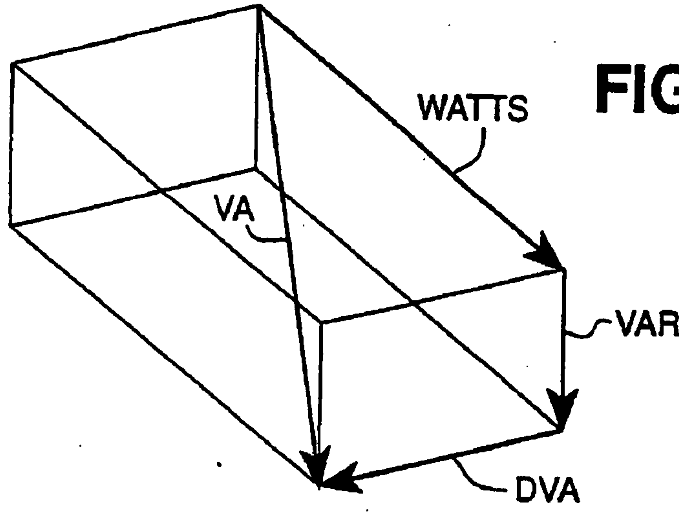


FIG - 6a

Amended

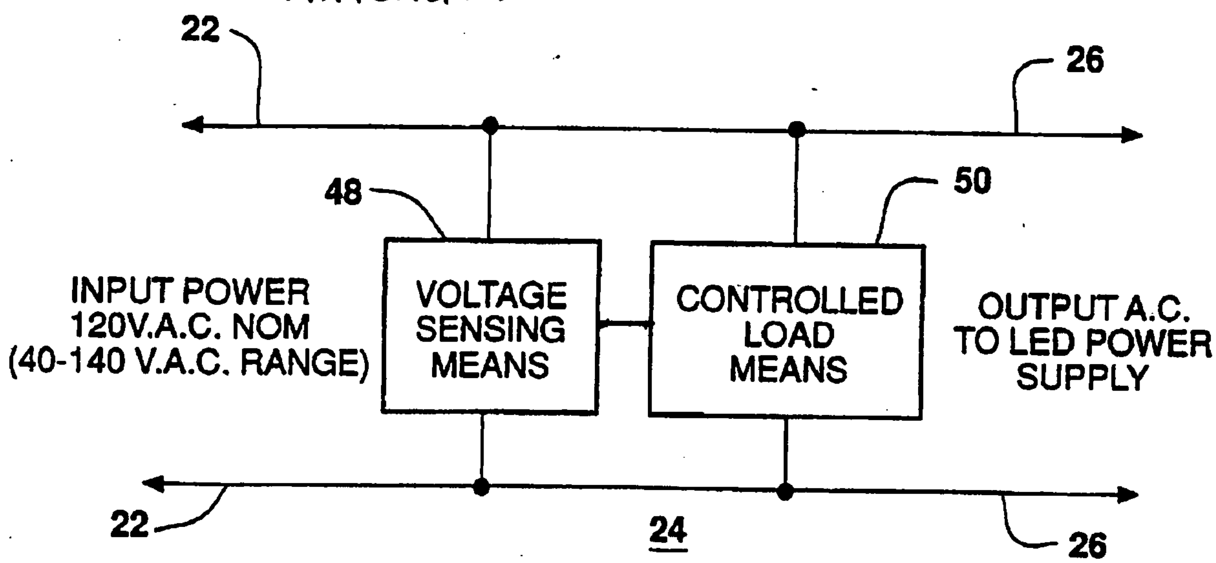
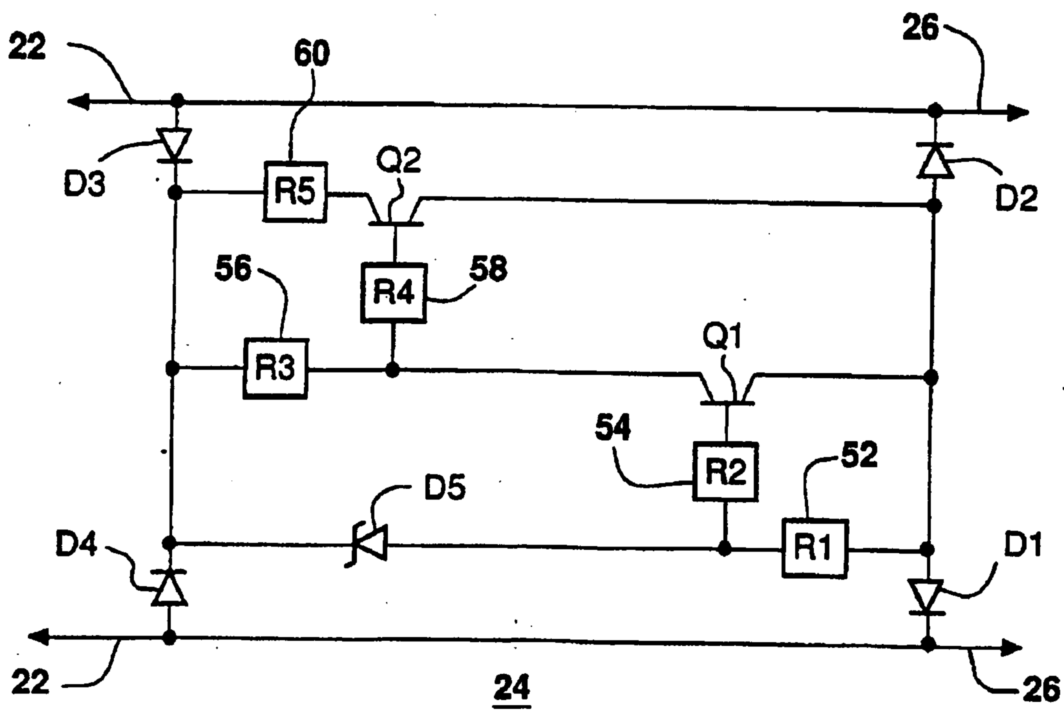


FIG - 6b



Annotated Marked-up Drawing

APPENDIX

Pursuant to 37 C.F.R. § 1.173(c), the following shows the current status of claims 1-53 of the above-identified application upon entry of the Preliminary Amendment of April 13, 2007, submitted herewith.

1. to 6. (Canceled)

7. (Currently amended) An apparatus for supplying regulated voltage d.c. electrical power to an LED array comprising:

a rectifier means (32) having an input and an output, said rectifier means (32) being responsive to a.c. power at said input for generating rectified d.c. power at said output;

a power factor correction converter means (38) having an input connected to said output of said rectifier means (32) and an output, said power factor correction converter means (38) being responsive to said rectified d.c. power at said power factor correction converter means input for generating regulated voltage d.c. power at said power factor correction converter means output;

an LED array (12), defined as consisting of series-parallel connected LED devices, having an input connected to said output of said power factor correction converter means (38) for receiving said regulated voltage d.c. power to illuminate said LED array (12); <u>and</u>

a battery backup means (62) having an input for receiving a.c. power applied to said input of said rectifier means (32) and having an output at which d.c. power is generated, and a switch-over means (82) connected to said output of said battery backup means (62) and to said rectifier means input, said battery backup means (62) being responsive to a failure of a.c. power at said battery backup means input for controlling said switch-over means (82) to connect said output of

said battery backup means (62) to said input of said rectifier means (32) to provide d.c. power to illuminate said LED array (12) and being responsive to a.c. power at said battery backup means input for controlling said switch-over means (82) to disconnect said battery backup means output from said rectifier means input.

8. (Original) The apparatus according to claim 7 wherein said switch-over means (82) is an electromechanical relay.

9. (Original) The apparatus according to claim 7 wherein said battery backup means (62) includes a time delay and restoration means (78) responsive to application of a.c. power at said input of said battery backup means (62) for controlling said switch-over means (82) to disconnect said output of said battery backup means (62) from said input of said full wave rectifier means (32) and connect the a.c. power to said full wave rectifier means input after a predetermined time delay.

10. (Original) The apparatus according to claim 7 wherein said battery backup means (62) includes a dc. power switch-over and flasher means (80) connected to said switch-over means (82) for pulsing said dc. power at a predetermined rate to flash said LED array (12).

11. (Original) The apparatus according to claim 7 wherein said battery backup means (62) includes a synchronizing pulse generator means (86) connected to said d.c. power switchover and flasher means (80) for imposing marker pulses on said d.c. power at a predetermined rate.

12. (Currently amended) An apparatus for supplying regulated voltage d.c. electrical power to an LED array comprising:

a rectifier means (32) having an input and an output, said rectifier means (32) being responsive to a.c. power at said input for generating rectified d.c. power at said output;

a power factor correction converter means (38) having an input connected to said output of said rectifier means (32) and an output, said power factor correction converter means (38) being responsive to said rectified d.c. power at said power factor correction converter means input for generating regulated voltage d.c. power at said power factor correction converter means output;

an LED array (12), defined as consisting of series-parallel connected LED devices, having an input connected to said output of said power factor correction converter means (38) for receiving said regulated voltage d.c. power to illuminate said LED array (12); and

a half wave power detector means (88) having an input connected to said input of said rectifier means (32) and an output connected to another input of said power factor correction converter means (38), said half wave power detector means (88) being responsive to a dimming signal at said rectifier means input for generating a control signal at said half wave power detector means output and said power factor correction converter means (38) being responsive to said control signal for decreasing said regulated d.c. power to dim said LED array (12).

13. (Currently amended) The apparatus for supplying regulated voltage d.c. electrical power to an LED array comprising:

a rectifier means (32) having an input and an output, said rectifier means (32) being responsive to a.c. power at said input for generating rectified d.c. power at said output;

a power factor correction converter means (38) having an input connected to said output of said rectifier means (32) and an output, said power factor correction converter means (38) being responsive to said rectified d.c. power at said power factor correction converter means

input for generating regulated voltage d.c. power at said power factor correction converter means output;

an LED array (12) defined as consisting of series-parallel connected LED devices, having an input connected to said output of said power factor correction converter means (38) for receiving said regulated voltage d.c. power to illuminate said LED array (12); <u>and</u>

a pulse width modulated modulator means (46) connected to said output of said power factor correction converter means (38) and to said input of said LED array (12) for modulating said regulated voltage d.c. power and a half wave power detector means (88) having an input connected to said input of said rectifier means (32) and an output connected to an input of said pulse width modulated modulator means (46), said half wave power detector means being responsive to a dimming signal said rectifier means input for generating a control signal at said half wave power detector means output and said pulse width modulated modulator means (46) being responsive to said control signal for decreasing said regulated d.c. power to dim said LED array (12).

14. (Original) An apparatus for supplying regulated voltage d.c. electrical power to an LED array comprising:

a power supply means (10) having an input and an output, said power supply means (10) being responsive to a.c. power at said input for generating regulated voltage d.c. power at said output to illuminate an LED array (12) connected to said power supply means output; and

a dimming detector means (88) having an input connected to said input of said power supply means (10) and an output connected to another input of said power supply means (10), said dimming detector means (88) being responsive to a dimming signal at said power supply means input for generating a control signal at said dimming detector means output and said

power supply means (10) being responsive to said control signal for decreasing said regulated voltage d.c. power to dim the LED array (12).

15. (Original) The apparatus according to claim 14 wherein said dimming detector means (88) is a half wave power detector means, said dimming signal is half wave rectified a.c. power and said power supply means (10) includes a rectifier means (32) having an input connected to said power supply means input and an output and a power factor correction converter means (38) having an input connected to said rectifier means output and an output connected to said power supply output, said power factor correction converter means (38) including said another input of said power supply means (10), said power factor correction converter means (38) being responsive to said control signal for decreasing said regulated voltage d.c. power to dim the LED array (12).

16. (Original) The apparatus according to claim 14 wherein said dimming detector means (88) is a half wave power detector means. said dimming signal is half wave rectified a.c. power and including a pulse width modulated modulator means (46) connected to said output of said power supply means (10) for modulating said regulated voltage d.c. power, said pulse width modulated modulator means (46) including said another input of said power supply means (10), said pulse width modulated modulator means (46) being responsive to said control signal for decreasing said regulated voltage d.c. power to dim the LED array (12).

17. (Original) An apparatus for supplying regulated voltage d.c. electrical power to an LED array comprising:

a rectifier means (32) having an input and an output, said rectifier means (32) being responsive to a.c. power at said input for generating rectified d.c. power at said output;

a power factor correction converter means (38) having an input connected to said output of said rectifier means (32) and an output, said power factor correction converter means (38) being responsive to said rectified d.c. power at said power factor correction converter means input for generating regulated voltage d.c. power at said power factor correction converter means output;

a battery backup means (62) having an input for receiving a.c. power applied to said input of said rectifier means (32) and having an output at which d.c. power is generated; and

a switch-over means (82) connected to said output of said battery backup means (62) and to said input of said rectifier means (32), said battery backup means (62) being responsive to a failure of a.c. power at said battery backup means input for controlling said switchover means (82) to connect said battery backup means output to said rectifier means input to provide d.c. power to said power factor correction converter means (38) to illuminate an LED array connected to said output of said power factor correction converter means (38) and being responsive to a.c. power at said battery backup means input for controlling said switch-over means (82) to disconnect said battery backup means output from said rectifier means input.

18. (Original) The apparatus according to claim 17 wherein said power factor correction converter means (38) is a power factor correcting and voltage regulating buck/boost switchmode converter.

19. (Original) The apparatus according to claim 17 including an adaptive clamp circuit means (24) connected to said input of said rectifier means (32) for eliminating leakage current problems, said adaptive clamp circuit means (24) having an input adapted to be connected to a pair of a.c. power lines (22), a pair of clamp circuit output lines (26) connected to said adaptive clamp circuit means input, a voltage sensing means (48) connected across said adaptive clamp

circuit means input, and a controlled load means (50) connected across said clamp circuit output lines (26) and to said voltage sensing means (48), said voltage sensing means (48) being responsive to a magnitude of a.c. voltage at said adaptive clamp circuit means input lower than a predetermined magnitude for turning on said controlled load means (50) to connect a low impedance load (60) in said controlled load means (50) across said clamp circuit output lines (26) and said voltage sensing means (48) being responsive to a magnitude of the a.c. voltage at said adaptive clamp circuit means input equal to or greater than said predetermined magnitude for turning off said controlled load means (50) to disconnect said low impedance load (60) from said clamp circuit output lines (26).

20. (Original) The apparatus according to claim 17 wherein said battery backup means (62) includes a time delay and restoration means (78) responsive to application of a.c. power at said input of said battery backup means (62) for controlling said switch-over means (82) to disconnect said output of said battery backup means (62) from said input of said rectifier means (32) and connect the a.c. power to said rectifier means input after a predetermined time delay.

21. (Original) The apparatus according to claim 17 wherein said battery backup means (62) includes a d.c. power switch-over and flasher means (80) connected to said switch-over means (82) for pulsing said d.c. power at a predetermined rate to flash said LED array (12).

22. (Currently amended) The apparatus according to claim 17 wherein ~~Wherein~~ said battery backup means (62) includes a synchronizing pulse generator means (86) connected to said d.c. power switch-over and flasher means (80) for imposing marker pulses on said d.c. power at a predetermined rate.

23. (Original) An apparatus for supplying regulated voltage d.c. electrical power to an LED array comprising:

a rectifier means (32) having an input and an output, said rectifier means (32) being responsive to a.c. power at said input for generating rectified d.c. power at said output;

a power factor correcting and voltage regulating buck/boost switchmode converter (38) having an input connected to said output of said rectifier means (32) and an output, said switchmode converter (38) being responsive to said rectified d.c. power at said switchmode converter input for generating regulated voltage d.c. power at said switchmode converter output;

an LED array (12) having an input connected to said output of said switchmode converter (38) for receiving said regulated voltage d.c. power to illuminate said LED array (12);

a battery backup means (62) having an input for receiving a.c. power applied to said input of said rectifier means (32) and having an output at which d.c. power is generated; and

a switch-over means (82) connected to said output of said battery backup means (62) and to said input of said rectifier means (32), said battery backup means (62) being responsive to a failure of a.c. power at said battery backup means input for controlling said switchover means (82) to connect said battery backup means output to said rectifier means input to provide d.c. power to said switchmode converter (38) illuminate said LED array (12) and being responsive to a.c. power at said battery backup means input for controlling said switch-over means (82) to disconnect said battery backup means output from said rectifier means input.

24. (Currently amended) A power supply assembly for powering light emitting diodes (LEDs) in an outdoor line-connected signal, comprising:

an electrical input for coupling to a source of a.c. line voltage through a solid state traffic controller switch for providing an electrical input voltage having an operating range when the switch is on;

a rectifier coupled to the electrical input and having a rectifier output;

a line voltage regulating switchmode power supply having a power supply input coupled to the rectifier output and ~~having~~ a power supply output;

a plurality of LEDs coupled to the power supply output and having multiple current paths for ~~dissipating power and~~ emitting light in response to the power supply output; and

~~an electromagnetic interference filter means coupled to the power supply for preventing conducted interference from feeding back onto a.c. power lines connected to the electrical input~~

a conflict monitor compatibility circuit including a low impedance load and a transistor in series connection with the low impedance load, the transistor being biased as a switch having an essentially nonconductive condition whenever the electrical input voltage is within the operating range and an essentially conductive condition if the electrical input voltage drops below a predetermined value lower than the operating range, wherein the transistor in the essentially conductive condition couples the low impedance load to the electrical input for shunting leakage current from the solid state traffic controller switch when the switch is off ~~; and a traffic, pedestrian or rail crossing signal housing enclosing the assembly~~.

25. to 27. (Canceled)

28. (Currently amended) A power supply assembly for powering light emitting diodes (LEDs) in an outdoor line-connected signal, comprising:

an electrical input for coupling to a source of a.c. line voltage through a solid state traffic controller switch for providing an electrical input voltage having an operating range when the switch is on;

a rectifier coupled to the electrical input and having a rectifier output;

a switchmode power supply ~~coupled to the output of the rectifier~~ for maintaining current and voltage waveforms substantially in phase and for providing a regulated current output with respect to variations in the input line voltage, the power supply having a power supply input coupled to the rectifier output and a power supply output;

a plurality of LEDs coupled to the power supply output and having multiple current paths for ~~dissipating power and~~ emitting light in response to the power supply output; and

~~an electromagnetic interference filter means coupled to the power supply for preventing conducted interference from feeding back onto a.c. power lines connected to the electrical input~~

a conflict monitor compatibility circuit including a low impedance load and a transistor in series connection with the low impedance load, the transistor being biased as a switch having an essentially nonconductive condition whenever the electrical input voltage is within the operating range and an essentially conductive condition if the electrical input voltage drops below a predetermined value lower than the operating range, wherein the transistor in the essentially conductive condition couples the low impedance load to the electrical input for shunting leakage current from the solid state traffic controller switch when the switch is off ~~; and a traffic, pedestrian or rail crossing signal housing enclosing the assembly~~.

29. to 31. (Canceled)

32. (Currently amended) A power supply assembly for powering light emitting diodes (LEDs) in an outdoor line-connected signal, comprising:

an electrical input for coupling to a source of a.c. line voltage through a solid state traffic controller switch for providing an electrical input voltage having an operating range when the switch is on;

a rectifier coupled to the electrical input and having a rectifier output;

a ~~current regulating~~ switchmode power supply ~~coupled to the output of the rectifier~~ for improving poor power factor, whereby the power supply provides essentially constant current at a power supply output with respect to variations in line voltage input, and whereby current and voltage waveforms are maintained substantially in phase, the power supply having a power supply input coupled to the rectifier output and a power supply output;

a plurality of LEDs coupled to the power supply output and having multiple current paths for ~~dissipating power and~~ emitting light in response to the power supply output; and

~~an electromagnetic interference filter means coupled to the power supply for preventing conducted interference from feeding back onto a.c. power lines connected to the electrical input~~

a conflict monitor compatibility circuit including a low impedance load and a transistor in series connection with the low impedance load, the transistor being biased as a switch having an essentially nonconductive condition whenever the electrical input voltage is within the operating range and an essentially conductive condition if the electrical input voltage drops below a predetermined value lower than the operating range, wherein the transistor in the essentially conductive condition couples the low impedance load to the electrical input for shunting leakage current from the solid state traffic controller switch when the switch is off ~~; and a traffic, pedestrian or rail crossing signal housing enclosing the assembly~~.

33. to 36. (Canceled)

37. (Currently amended) The assembly according to claim 24, 28 or 32 ~~claims 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34 or 35~~ wherein the switchmode power supply comprises an integrated circuit power supply.

38. (Previously presented) The assembly of claim 37 wherein the integrated circuit power supply comprises a power factor correcting switchmode converter integrated circuit.

39. and 40. (Canceled)

41. (Currently amended) The assembly according to claim 24, 28 or 32 ~~claims 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34 or 35~~ wherein the plurality of LEDs comprise a plurality of series-parallel connected LEDs arranged in strings.

42. (Previously presented) The assembly according to claim 41 wherein the plurality of LEDs comprise a ballast resistor in each string.

43. (Canceled)

44. (Currently amended) A conflict monitor compatibility circuit for use in traffic and pedestrian signaling applications, comprising:

a plurality of LEDs for emitting light in response to an electrical input adapted to be coupled to a source of a.c. line voltage through ~~an LED load providing a high impedance condition in the presence of leakage currents from~~ a solid state traffic controller switch for providing an electrical input voltage having an operating range when the switch is on;

a transistor ~~coupled to the LED load and~~ biased as a switch that has ~~switches from~~ an essentially nonconductive condition whenever the electrical input voltage is within the operating range and ~~in the absence of the high impedance condition to~~ an essentially conductive condition

if the electrical input voltage drops below a predetermined value lower than the operating range ~~in the presence of the high impedance condition~~; and

a low impedance load in series connection with the transistor, wherein the transistor in the essentially conductive condition couples the low impedance load to the electrical input for shunting leakage current from the solid state traffic controller switch when the switch is off ~~and in parallel connection with the LED load, whereby leakage currents are shunted through the low impedance load, ensuring compatibility with the conflict monitors designed for incandescent bulbs~~.

45. (Canceled)

46. (New) The assembly according to claim 24, 28, or 32, wherein the conflict monitor compatibility circuit further includes a sensor for providing a control output if the electrical input voltage drops below the predetermined value and a control element for switching the transistor to the essentially conductive condition in response to the control output.

47. (New) The assembly according to claim 46, wherein the sensor is a Zener diode that conducts in a reverse direction only at voltages above the predetermined value.

48. (New) The assembly according to claim 47, wherein the control element is a second transistor biased as a switch and having a base coupled to the Zener diode.

49. (New) The assembly according to claim 24, 28, or 32, further comprising an electromagnetic interference filter coupled to the power supply for preventing conducted interference from feeding back onto the a.c. line.

50. (New) The assembly according to claim 24, 28, or 32, further comprising a traffic, pedestrian or rail crossing signal housing enclosing the assembly.

51. (New) The conflict monitor compatibility circuit according claim 44, further comprising a sensor for providing a control output if the electrical input voltage drops below the predetermined value and a control element for switching the transistor to the essentially conductive condition in response to the control output.

52. (New) The conflict monitor compatibility circuit according to claim 51, wherein the sensor is a Zener diode that conducts in a reverse direction only at voltages above the predetermined value.

53. (New) The conflict monitor compatibility circuit according to claim 52, wherein the control element is a second transistor biased as a switch and having a base coupled to the Zener diode.